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AUTHOR Tao, Lingling; Reinking, David
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ABSTRACT

How educators, especially those in the field of literacy, view and make use of email and its text-based features has been the subject of research. Journal articles addressing what educators and researchers know about email and how they work with email communication were reviewed. Email has moved from a limited group of users to the masses. According to researchers, email communication has the following prominent features: text-based features; multiple connections and easy transmission; asynchrony and synchrony; easy storage and manipulation; rapidity and cost-efficiency; and relative anonymity. Existing research literature can be divided into 3 parts: using email as a research tool and other research concerns stated; focusing on user perception and adoption of email in instructional settings; and assessing the effects of email communication on users. Existing literature on teaching usually consists of action research studies which help to inform the ongoing instruction within the classroom. Some also tend to be more summative in their concerns about the students' performance in classes. Suggestions for future research on email in instructional settings are: (1) take advantage of text-based nature of email communication; (2) determine the extent to which beneficial gains of students concerning instructional goals would be optimal; (3) investigate non-traditional learners such as part-time students and English-as-a-Second Language students; (4) study more in-depth the language features of email communication; and (5) investigate the textual context and interactive demands of email communication for students below the fifth-grade level. (Contains 41 references.) (RS)

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What Research Reveals About Email in Education

Liqing Tao
David Reinking

University of Georgia

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Email communication grows rapidly in recent decades. As some researchers estimate this trend of email using will continue to develop (see Garton & Wellman, 1995). In our daily life, we have observed the wide-spread use of email communication. Email becomes such a popular means of communication that name cards nowadays usually carry email address along with phone and fax numbers. This email phenomenon certainly affects the physical world in which we live and consequently influences our perceptions of and interactions with the world around us. Since our schools are supposed to prepare our students for the real world, we as educators and researchers can't avoid this widespread email phenomenon in the world, especially when this email communication is also making its way into the school situations (Harris, 1996).

As a matter of fact, this email phenomenon becomes all the more relevant to education due to its prominent text-based nature. How the educators, especially those in the field of literacy, should view and make use of email and its text-based feature would be a natural question to ask when faced with its mushrooming growth in schools.

The present review intends to pose such questions in regard to our present understanding and exploitation of email communication in instructional settings. We therefore will begin our review by first offering our criteria in selecting papers to be reviewed, and then going over the characteristics of email communication as defined by researchers. By so doing, we hope to establish the framework for our review which follows.

Paper selection

We are interested in what educators and researchers know and have worked with email communication. So our concentration of paper selection is on literature of email in education. This sometimes is a hard rule to follow completely, because many researchers from communication, business organizations, and other fields are always using college students and faculty as their subjects for studies which might involve educational implications. When facing such a case, we would make a judgment call and make our decision based on the degree of their relevance to education. We based our search of the papers mainly on a previous review of literature done by the first author (Tao, 1995). We also try to include the studies which are being left out in the previous review. However due to the nature of publication speed and increased attention of researchers towards this phenomenon, we found it impossible to include all the studies on email in education out there. But we did make the following efforts to locate a relevant paper:

1) Papers concerning email in education in published journals are selected using ERIC online and hand search; ERIC documents are not included based on the assumption that journal articles usually catch better the essence of research on email.

2) Papers published in journals outside education are also included if they are deemed relevant to the questions we are interested. As a result, some research from some other fields

such as communication are also included.

3) Papers referred to by the papers we have located by the previous two criteria are also examined to determine their relevance to the present purpose. If deemed relevant, they are also included.

Definition of email

Email is the short form for electronic mail. By definition it is mail delivered through electronic means. However, at the present age of rapid technological development, we should not view the definition of email being static. Rather it would be helpful if we can view email as evolving and somewhat fluid in its definition. We would like to discuss about various definitions of email to illustrate what we mean by static and fluid nature of email definition.

Tracing the development of email communication in various fields, we have at least three definitions of email (see Tao, 1995):

1) A broadest definition of email states that mail being transmitted electronically is email. This definition would embrace fax and telex.

2) Another definition of email limits itself to only communication through computers but would include graphics as well as texts as appropriate email communication.

3) A third definition of email agrees with the second one but would only limit itself to texts being transmitted through computers between senders and receivers.

A brief look at the history of email origin might help us in understanding better the definitions of email. The earliest email communication was set up by a group of experts working on projects for the Department of Defense around 1960. It was a privileged group of computer and technical elites. However, it quickly spread and becomes a very populous means of mass communication in the 80's and 90's. How come it has been transformed from an "elite" means of communication to mass communication? The answer seems to be two-fold. One the one hand, this kind of communication has the potential of becoming a mass communication from its birth. It was reported that communications among experts were never restricted to technical nature only. On the contrary, they quickly became a means of small talks on the computers and rules had to be implemented to ensure its main usage. Ever since its birth, email communication has been a means of carrying on conversations with strangers and acquaintance alike. On the other hand, this potential can only be realized through the wide-spread use of personal computers which came into being in the 70's. With the personal computers becoming more accessible (both in terms of price and large quantity manufactured) and interfaces becoming more friendly (both in terms of the hardware and software), email communication is now readily available either through commercial or non-commercial carriers.

Then what does all this have anything to do with email definitions? It shows us at least two points. First email has

moved from a limited group of users to the masses. Second, email communication largely depends upon technological development to fulfil its functions.

The first point provides a possibility of email being defined by people in different disciplines. Due to the different uses it has been viewed and put to in different disciplines, email will no doubt undergo some definition changes in corresponding fields. For example, the first definition of email is usually held by people in telecommunication and at system support levels; the second definition is more embraced by people concerning internet and information management; the third definition has more appealing to the social scientists and educators.

The second point indicates the importance of technology development in shaping email definitions. For example, when graphics were not easily processed by the computers, it would be impossible even to define email including graphics. For another example, while fax and phone functions are gradually being built into computers and are being processed electronically, it would be hard even to tell what's email message and what's "faxed" message.

Therefore, the development of email communication tells us email definition is never static but fluid and evolves with the users and technological development.

Having said this, we would like to offer our definition of email here for the sake of setting up part of the framework for our ensuing review.

We follow the somewhat narrow definition of the third one by defining electronic mail as being messages in text form sent via computer networks from one person to another or to many others. It will include the normal mail function and conferencing, and newsgroup functions. We believe this would allow us to focus on the text-based nature of email communication and its effects in education.

Review and Findings

The literature reviewed will be summarized and discussed in two section: a brief summary of the characteristics of email; a summary of what researchers have done concerning the relevant features of email in education.

Characteristics of email

According to researchers (see Garton & Wellman, 1995; Tao, 1995) across various disciplines, email communication has the following prominent features:

1) Text-based nature. Email users have to use their literacy skills either to decode/encode and negotiate their positions through texts. The language is the major means by which email communication is done.

2) Multiple connections and easy transmission. Email users may send their messages to more than one receiver without typing the messages over again. This allows an expansion of their horizontal connections, often times beyond their own usual social

groups. The distance is seldom a barrier in email communication. In forwarding a message to any one and everyone, email users can do it by pressing several keys.

3) Asynchrony and synchrony. Email communication can overcome the time lag which phone users are frustrated by. Users of email communication don't have to be in the same place (as in a conversation) or at the same time (as in a phone conversation). So users do not usually feel the pressure of timely responses. However, as technology promises, email users can also engage in a synchronous conversation.

4) Easy storage and manipulation. Messages sent can easily be stored either for future use or edited for present use. The ease of its use is such that a user won't even feel the pain one will experience in having to copy a paper version.

5) Rapidity and cost-efficiency. The messages can be transmitted in a matter of seconds or minutes. It shortens the time a conversation over the phone might require. It also reduces the possible paper cost in many cases.

6) Relative anonymity. Unlike face-to-face communication, users of email communication usually do not have a sense of the presence of the interlocutor or one's own exposure to the public as in a traditional classroom.

What researchers in education have done

Going over the literature we have collected, we sorted the literature into two parts: that which deals with research; that which emphasizes teaching. We will then briefly summarize the promises and caveats of email in instructional settings raised by the researchers.

1) Research.

This part actually forms the larger portion of the literature we have reviewed. They could roughly be divided into three parts:

A) Using email as a research tool and other research concerns stated. Some research we have reviewed fall into this part. They simply exploit the advantage of email in carrying out some tasks. For example, Thach (1995) has laid out advantages and disadvantages of using email for conducting survey questionnaire research. This kind of email usage is usually explored by people in the communication and organization. Researchers are also concerned with ethic and legal aspects of email usage. Olia and Martin (1994), for instance, have conducted a survey research to detect ethical issues in using email in a traditionally deaf college. D'Souza (1992) speculates the various uses email could be put to in instructional and administrative settings.

B) Focusing on user perception and adoption of email in instructional settings. Almost all the studies we will mention in the teaching section touch upon this. But there are some studies which are carried out exclusively for understanding faculty's use and acceptance of email (Golden, Beauclair, & Sussman, 1992; Komsky, 1991; Parry & Wharton, 1995). For instance, Golden et al.'s study (1992) aims to identify factors which influence email use in a university setting. Parry and Wharton (1995) have done a

similar study but approached it from a different angel. They factor in the different fields faculty members are in and find disciplines to be the most influential factor in faculty's acceptance of email.

C) Assessing the effects of email communication on users. This part could be further divided into two areas.

I. General effects of email communication. The studies fall into this category tend to look at the effects email have on users' communication processes or products in comparison to other media. Adrianson and Hjelmquist (1993) have investigated such general effects of email communication in comparison with face-to-face communication on retention of texts. Experienced users seem to have a better performance in computer communication while the inexperienced users performed better in face-to-face communication. Another study conducted by Wilkins (1991) has looked into language features of email messages from a social-linguistic perspective. The study finds that users have used informal verbal features to compensate when using email communication. Online behaviors of undergraduate students are studied by McCormick and McCormick (1992) using content analysis approach. Content of email is found associated with certain periods within the academic schedule.

II. Effects on special groups. Some researchers have focused upon the email communication's effects upon certain populations. For example, Zimmerman (1987) studies the effects of email on the language use of emotionally disturbed adolescents. Some communication improvement has been found when they are engaged in email communication. Mabrito (1991) has looked into the email's effect on the verbal responses of high and low apprehensive writers in a writing class. Face-to-face and email peer responses are compared. High apprehensive writers are found to tend to have more input via email. Coombs (1993) also reports the increased interactions via email communication for the hearing-impaired and speaking-impaired learners.

2) Teaching.

This part of the literature contrasts with the foregoing part in its direct applications of email communication in instructional settings. Results seem to point back to the features of email communication identified before. However, going over the literature carefully, we have identified the following two points as the most prominent. These two points are of interest both in terms of research orientations and pedagogical underpinnings.

A) Communication and interaction patterns. Several papers concerning email application in instructional settings fall under this heading. Studies we have reviewed in the instructional settings have provided evidence of altered learning and classroom interaction patterns and atmosphere via email communication (Anderson and Lee, 1995; Dreher, 1984; Fey, 1994; Hiltz, 1986; Kindead, 1987; Lowry, Koneman, Osman-Jouchoux, & Wilson, 1994; Owen, 1990; Rice-Lively, 1994; Riel, 1985; Robinson, 1994; Romiszowski & de Haas, 1989; Schwartz, 1990). For example, in

Anderson and Lee's study, they report their implementing email communication as part of the interaction among students and the instructor. They found favorable students' responses to the use of email and interesting interactions among students. Fey (1994) also supports the thesis that email communication facilitates the interactions and peer collaborations by detailing her experience with a group of writing students. Schwartz (1990) makes a case in stating the usefulness of email communication among high school students across different areas. Students tend to have a better sense of audience and be more willing to understand others from their perspectives. In Traw's study (1994), students in a literacy class collaborated with elementary students in a local students through email communication in developing their lesson plans. The learning patterns of traditional classrooms are believed to have been changed through email collaboration. Both parties benefit from this experience. An ethnographic study by Rice-Lively (1994) bears out the changing patterns of interactions among a networked class. Student-centered learning seems to be more salient in email communication than in the traditional class meeting. Even in an early study (Dreher, 1984) on Australian use of email, Dreher noticed the increased student and instructor interaction patterns. Lowry et al. (1994) observed the students feel more enjoyable in using email communication.

Manipulations of possible interaction patterns are also studied by some researchers. For example, Adkins and Brashers (1995) have studied the effects of power of language through email communication. They find powerful language use is being perceived as an indication of being more credible during email communication. Ahern, Peck, and Laycock's study (1992) manipulates teacher's discourse in email discussion to see the effects of discourse forms on students' participation.

Many of the research here have taken the advantage of some features of email communication and have reported the resulted benefits. For example, Schwartz's study (1990) certainly exploits the advantage of email's capacity of overcoming temporal and spatial distances. Fey (1994) and Anderson and Lee (1995) are using email's relative anonymity and asynchrony features to encourage their students to speak out. Traw's study (1994) would have been impossible without email's combined features of easy transmission function and spatial irrelevancy.

However, many of these studies are concerned with the processes of interactions in instructional settings brought about by email rather than end products. Both Schwartz (1990) and Traw (1994) have claimed that their students have gained in discourse maturity and better lesson plan production. But they have not researched into their claims to prove it. To us, this is legitimate, because most of these research can be called action research, the purpose of which is to inform our instruction and research. However, viewed from the angle of email features, it can be said that this focus has not examined the text-based feature of email.

B) Communication end products. Only a few studies fall into

this category. But we feel strongly that we still need to separate this as a category and stress its need for appropriate treatment. It emphasizes another pedagogical aspect of email application. In this sense, it can complement our understanding of email application and its effects in instructional settings if we can systematically address this issue of end products. Some researchers have studied the email communication in instructional settings from this perspective. For example, D'Souza's study (1991) finds that a group of sophomores taking a business information system course via email outperform those who take the traditional format of the course both in terms of the overall examination and the posttest of the study. Newman (1989) reports that seventh and eighth graders wrote longer texts as they are engaged in information sharing via email communication. Allen and Thompson (1995) have measured fifth grade students' writing via email with a partner through holistic scoring and find that male students' writing is significantly higher in the email situations than their counterparts in the control group. Some other studies use personal testimony of instructors to show end-product evidence of email communication (i.e., Wild & Winniford, 1993). However, while favorable evidence for email communication is reported by several researchers, some contradictory results are also present in literature on email. Smith (1994) reports no significant gains for the email users as compared with their regular control group peers in the final exams in a journalism class. Hiltz's report (1990) of a virtual classroom project also records no significant difference in college students' writing quality.

The conflicting results of end products in these limited studies might have pointed to different designs and methodological controls of these studies. They may also illustrate the various effects of email communication in different circumstances, thus calling for more in-depth studies on investigating functions of the text-based nature of email communication.

3) Promises and Caveats

Then what picture do we have about email in instructional settings? Due to the present stage of research on email in education, the picture is not at all clear yet. But we can summarize from the studies we have reviewed the following points of promises and caveats:

A) Promises

I) Email communications tend to bring out traditionally silent voices in a traditional classroom. Students are less intimidated in email than in a traditional classroom to speak out.

II) Email communications are motivating and therefore increase the interactions between students and instructors, and among students.

III) Email communications extend the connectivity of students beyond their traditional classroom, and consequently both expand their horizons and sensitize them to different cultures.

IV) Email communications allow students to have time to reflect before respond, and as a result students' responses could be better in quality than in a traditional classroom.

B) Caveats.

I) Students need to be instructed explicitly as to how to use email. Some students expressed their uneasiness in using email communication.

II) Due to the ready access, instructors tend to be overburdened with responding to students' queries and drafts of their writing assignments.

III) Logistic concerns of hardware maintenance and computer accessibility are expressed by many researchers.

Above are some of the advantages and disadvantages stated by the researchers. However, to round out this still nebulous picture, we would like to point out that age seems to be an unstated but important factor in email research. It is noteworthy that almost all the participants in the studies we have reviewed are either college students or high school students. Only two studies have involved 5th graders as email communication partners. We assume this tendency of involving older students is logically associated with the textual nature of email communication.

Conclusions and Suggestions

In sum, we have found that educators and educational researchers have already done some email research in instructional settings. The research literature generally contains two different types of research: research-oriented and classroom-oriented research. Many classroom-oriented studies are usually action studies which help to inform the on-going instructions within the classrooms. Some also tend to be more summative in their concerns about the students' performance in classes.

However, we feel that further efforts will be needed for us to better understand the role email will play or has been playing in instructional settings. Based upon our review of the literature, we offer the following suggestions for future research on email in instructional settings.

1) Text-based nature of email communication should be taken more advantage of in email research. As Kuehn (1994) has explicitly pointed out that more content analysis study of email is needed, we concur that the potential for content analysis approach is obviously provided by the text-based nature of email communication. Specifically, in the instructional settings, content analysis can help us understand better our students' behaviors and benefits in accordance with email communication. Besides, more regirous studies are in need to investigate both the process and product of email communications in school settings. For example, control groups might assist us in validating our research results concerning end-products via email communication.

2) While most of the studies reviewed incorporate email communication to some extent into their courses, it would be beneficial to carry out studies to determine the extent to which beneficial gains of students concerning our instructional goals

would be optimal. In other words, we are in need to know what roles can email play in helping us facilitate learning. For example, we might want to know what kind of courses are best delivered via email as a whole, and what courses would benefit most from incorporating email into the existing delivery system, and how learning is affected positively in certain courses.

3) Due to the relative anonymity of email, we would naturally expect studies on non-traditional learners such as part-time students and ESL students. They are rare. We hypothesize the relative anonymity, asynchrony, and text-based nature of email communication would provide students of ESL an opportunity to participate in the discussion of class. Such participation might result in at least two things. First they might participate more in classroom discussion which would certainly change the patterns of interaction within the class where there are ESL students. Second, they might get more chance to practice the language skills they are in much need of improvement.

4) Language features of email communication have received some attention (see Hawisher & Moran, 1993; Wilkins, 1991; Yates & Orlikowski, 1992). However, we need more in-depth studies to study situated language features of email communication. For example, with the listserv and newsgroups becoming so popular, it would be desirable to look into the situated language features of such groups. For practical reasons, it can establish some guidelines for teachers who want to introduce their students to such groups of interest. For theoretical interest, it might help us to position email communication among the various language behaviors such as paper writing, speaking and print reading.

5) As we pointed out briefly, email research has not involved students below 5th graders. We feel that it would be both instructively informative and theoretically feasible to study younger students' use of email communication. We assume the textual context and interactive demands of email communication may provide a text-rich and challenging environment for younger/beginning readers and writers.

When we were reviewing the literature on email in education, we were struck by the relative scarcity of literature out there. But as we finish the review, we strongly feel that there are a lot to be done and which can be done in regard to email's applications in instructional settings. While email communication becomes more and more popular and available in schools, quality research on email in education will inform educational application of email.

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